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THE ARTIFICIAL PRODUCTION OF MUTANTS—A
SUGGESTION

IN SCIENCE for September 13, 1907, Professor Spalding calls attention to the importance of Dr. MacDougal's discovery that new modifications can be made in plants by injecting various substances into the capsules of plants before the ovules are fertilized. I wish to suggest the desirability of a study of these artificially produced plant forms with a view to ascertaining whether the production of the new forms is coincident with a change in the number of chromosomes. It has recently been shown that deVries's *Enothera gigas* has twice as many chromosomes as the parent species, and a year ago I suggested that perhaps all of deVries's mutants may differ in a similar way from *Enothera lamarkiana*.

It is a very interesting question, should we find these mutations due to increase or decrease in the number of chromosomes, just what importance these mutations have in evolutionary progress. It certainly seems to me that we are a little hasty in ascribing to them fundamental importance. So far as we have any evidence on the subject, it seems to me that these mutants must be looked upon as aberrant forms, and in a certain sense degenerates. That all evolutionary progress depends upon these so-called mutations seems to me to be entirely out of the question, assuming, of course, a change in the number of chromosomes to be at the basis of mutation in the deVriesian sense. Too many distantly related species have the same number of chromosomes.

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AN ALLEGED DIPHTHERITIC ANTITOXIN

TO THE EDITOR OF SCIENCE: Notwithstanding previous denials on my part in the local papers and before the Columbus Academy of Medicine letters are being sent out by a local firm connecting my name with an alleged discovery of a new diphtheritic antitoxin.

I wish to state that such statements are absolutely unwarranted, as I have made no tests or investigations of any character con-

cerning the preparation, nor have any such tests been made in my laboratories.

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SPECIAL ARTICLES

HEART ROT OF SASSAFRAS SASSAFRAS CAUSED BY
FOMES RIBIS¹

So far as known, the tree *Sassafras sassafras* has very few enemies among the fungi, and is commonly very free from their attacks. It has, however, been found by the writer to be quite seriously affected in Missouri by one of the Polypori. The fungus which has thus been found attacking the *Sassafras* has been submitted to Professor Chas. H. Peck, and was pronounced to be *Fomes Ribis* (Schum.) Gillet. This fungus commonly occurs only upon the stems and roots of various species of small shrubby plants. It has been found occurring on rose bushes, currant bushes, and on living stems of *Symphoricarpus occidentalis*. The occurrence of this fungus upon any of the large trees seems to be anomalous, yet in a limited district it has been found thus occurring very plentifully and destructively.

Fomes Ribis occurs quite generally throughout European countries, but it does not seem to be at all common in America. It has been reported from as widely separated points as Kansas, Missouri, New Jersey and New York.

A careful examination showed that the sporophores of this fungus were always located at points where the heartwood of the tree had been exposed either by the breaking of branches or the splitting of the main trunk. No exception to this rule was observed, although the search was quite careful throughout the locality where the fungus was found. The smallest tree which was found to be affected was about five inches in diameter, and had abundant heartwood in the stem and older branches. The *Sassafras* has but few annual rings of sapwood, and thus reaches an age at which it has heartwood very early. It is believed that in this disease it is absolutely

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necessary for the tree to attain the age at which it has heartwood before it may become infected by this fungus; that is, it seems to be necessary that the tree shall have heartwood and that the heartwood must be exposed by some injury before *Fomes Ribis* is able to obtain an entrance to its trunk. While there is a bare possibility of exceptions to this rule, no such were found. Practically every tree, in which wounds were found by which the heartwood was exposed, was infected and bore one or more sporophores of the fungus. *Fomes Ribis* enters the trunk of the tree apparently in the same manner as do most of the so-called "wound parasites." It obtains a foothold in one of these injuries and gradually progresses into the heartwood of the stem; once entrance has been obtained to this, the rot gradually extends upward, downward and sidewise from its first entrance into the trunk until the tree finally dies or is broken over by the wind. When the heartwood has become completely affected through its entire thickness, the adjacent rings of the sapwood seem to prematurely assume the characters of heartwood, and the rot finally extends into them also; so that in extreme cases the sapwood is found to be even thinner than it normally is. Cases were found where this process apparently extended until the tree was killed outright. A number of other cases were also found in which but a single ring of the sapwood still remained alive.

The heartwood of *Sassafras* is normally of a rather dark brown color, but when attacked by this fungus it assumes a slightly redder and lighter color. This color of the rotted wood is undoubtedly due to the fact that the mycelium of this fungus is itself of a ferruginous brown color, and thus helps to give a brown coloration to the tissues within which it is located. The wood is very porous, and the fungus fills the large vessels and tracheids with its brown mycelium, forming tangled masses which completely fill their cavities. Between the healthy and the rotted wood is a narrow black zone. Microchemical tests indicate that the fungus does not exert a very active delignification upon the cell walls, but that the tendency seems to be for a more or

less complete local solution of the entire cell wall. The rotted wood seems to retain much of its original appearance, yet has been very decidedly weakened by the action of the fungus in dissolving the middle lamellæ from between many of the cells, so that they adhere to each other but slightly.

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NOTE ON THE MOVEMENT OF MOISTURE IN SOILS

IN teaching physics it is particularly important, whenever practical, to show how phenomena observed in nature are explained by facts discovered in the laboratory. For this reason it is hoped that the following, though containing nothing new in physics, may be of interest to those who have the honor of instructing others.

It is known that evaporation, condensation and surface tension, all play important roles in the movement of moisture in soils. The U. S. Department of Agriculture has conducted a number of investigations on these subjects, and has reached some valuable conclusions. The effects, however, due to changes in surface tension, produced by changes in temperature, have not been considered in detail, nor do I recall having seen them mentioned anywhere else.

It has long been known that the surface tension of a liquid increases as its temperature is lowered. In the case of water at least this relation continues at the same rate to and below the ordinary freezing point, provided the liquid condition is maintained; and therefore any change in the temperature of the soil, such as takes place to a greater or less extent every day and night, must produce a corresponding movement of its moisture towards the colder parts, where the surface tension is greatest. Besides, evaporation, which is most rapid where the temperature is highest, and condensation, which is greatest on the coldest surfaces, produce moisture movements in the same direction as those made by temperature changes in surface tension, so that the several causes work together. But, owing to a variety